Tools and services for observation preparation

G. Duvert, L. Bourgès

ESO & JMMC (VLTI) meeting

2021-07-07

Summary

- ASPRO2
- SearchCal / JSDC
- a2p2

ASPRO 2

Astronomical Software to PRepare Observations

ASPRO 2: Feature overview

- Observation preparation = **VLTI** / CHARA & their instruments
- Target & calibrator list with their models (geometric / FITS image/cubes, eg. from **AMHRA**)
- Target observability, UV coverage => info, but used also for scheduling
- **Noise modeling** & OIFits data simulator => **OIFITS data** (v1)
- Interoperability :
  - SearchCal (calibrator search), Vizier / Simbad (VOTable targets)
  - Export OB (VLTI) to ESO p2 through a2p2 (obxml)
  - OIFits Explorer, LITpro or OImaging …

ASPRO 2: Configuration

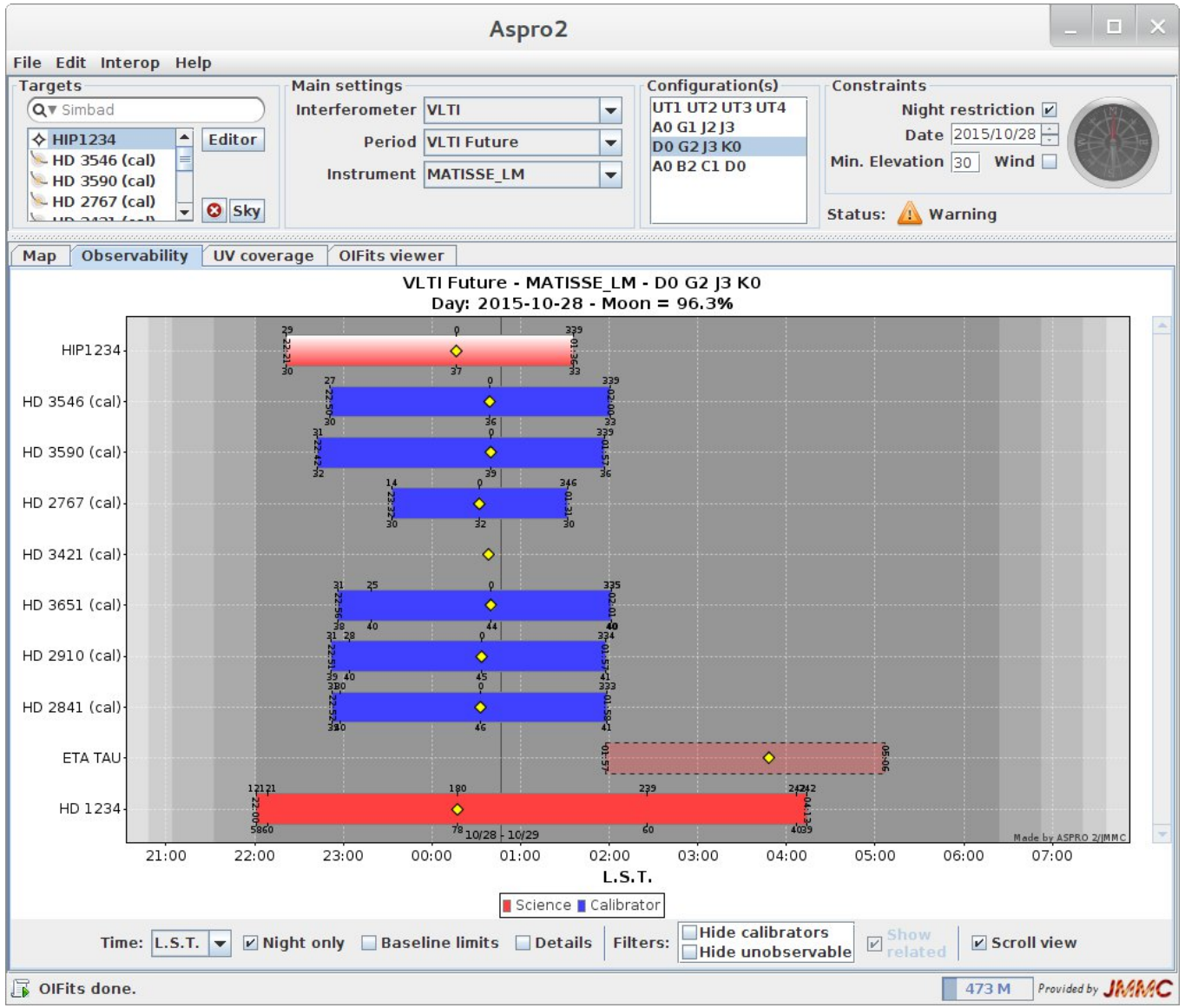
Configuration files : XML based

- Interferometer (telescope + horizon profiles, stations, delay lines, switchyard = optical paths between stations and lab)
- Instruments (instrument modes, noise parameters)
- Period : offered baselines per instrument

- VLTI (Period 84 - 108)
- MIDI (2T) until Period 94
- AMBER (3T) until Period 101
- PIONIER (4T) starting from Period 86
- GRAVITY (4T) starting from Period 98, (GRAVITY_FT to check the fringe tracker ability to track faint or unresolved targets)
- MATISSE (4T) starting from Period 103, (MATISSE_LM & MATISSE_N to describe the internal L/M & N instruments)

See http://apps.jmmc.fr/~swmgr/AsproOIConfigurations/ and aspro-conf @ github

ASPRO 2: Observability

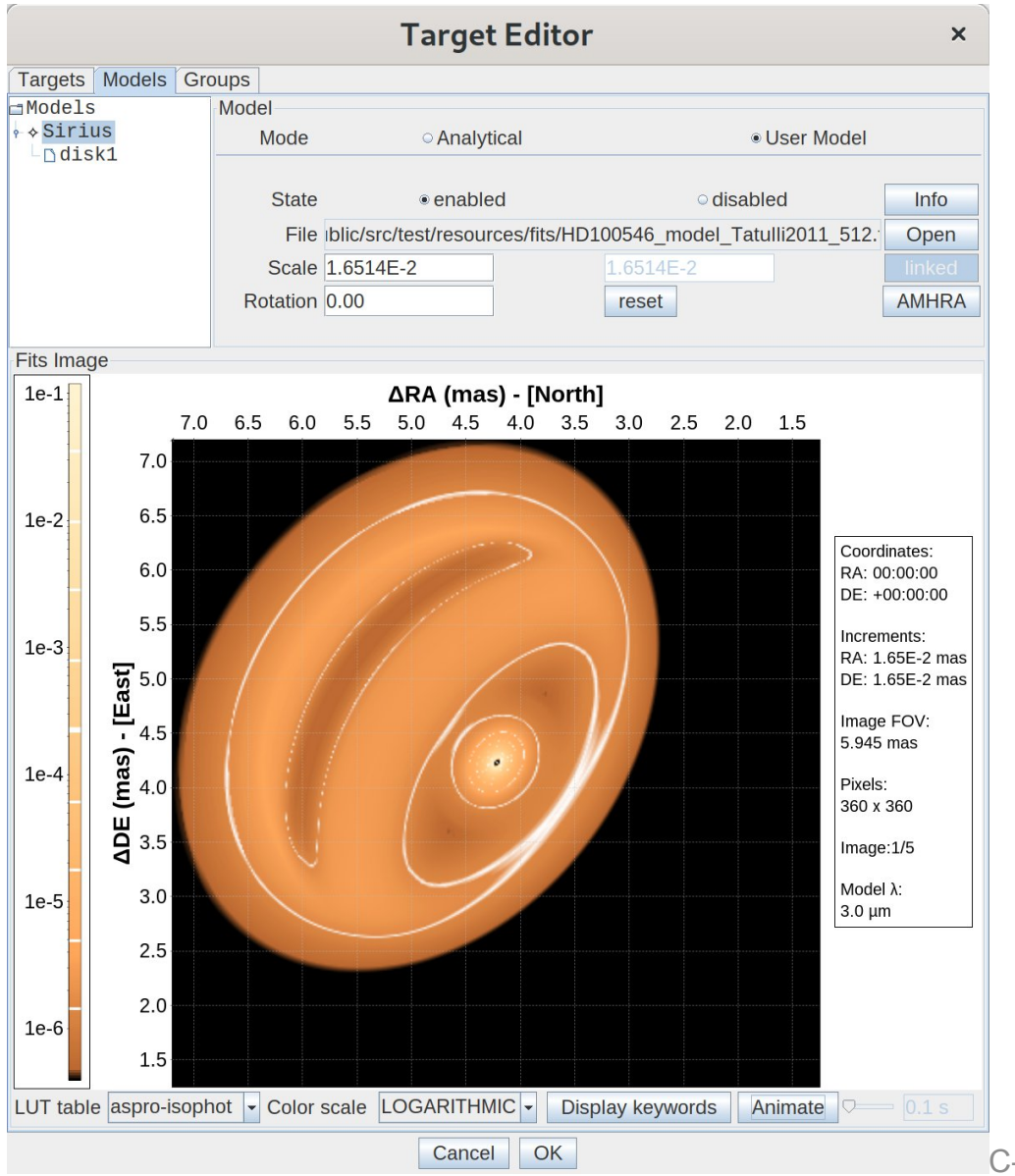


Observation:

Targets, array & instrument setup, baselines...

- SCI / CAL
- Horizon, DL, moon & wind constraints
- Baseline comparison
- Groups (FT, AO, user)
- Time markers (night mode)

ASPRO 2: Target Editor

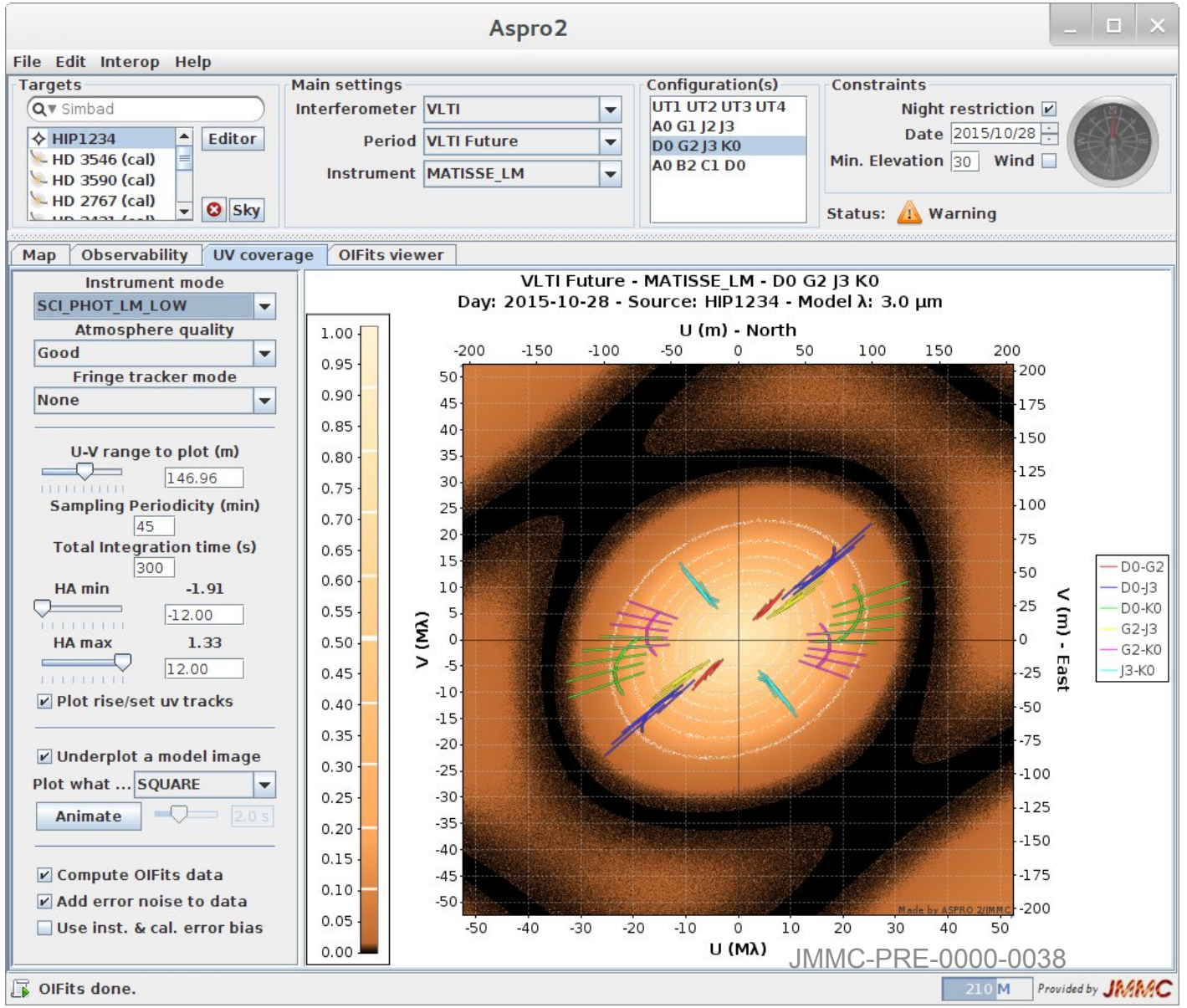


Target information:

- Position, pm, IDs
- Fluxes (mag / jy)
- Models
  - Analytical
  - or User model:

  Interoperable with any fits cube for polychromatic models

ASPRO 2: UV Coverage

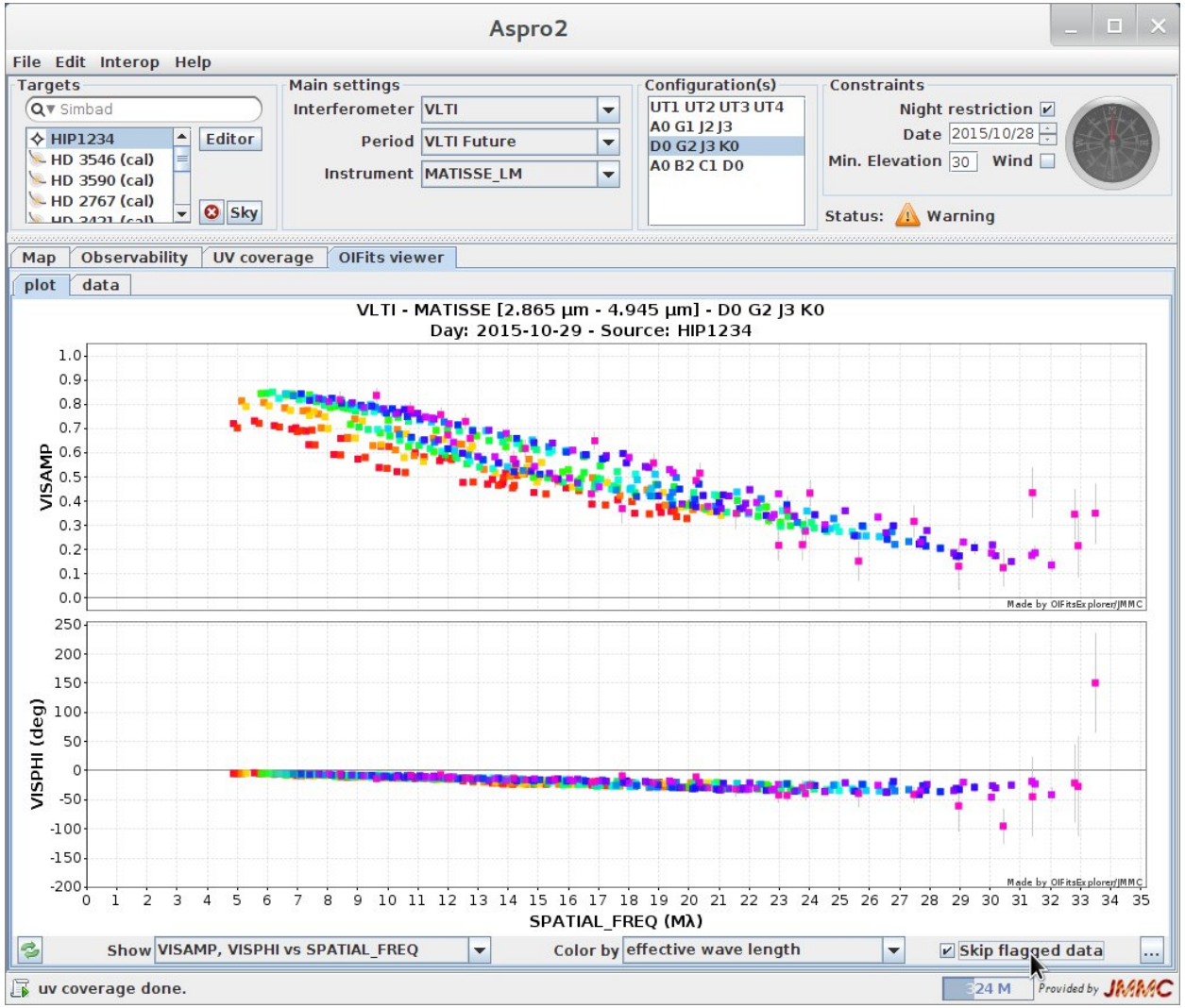


Example for MATISSE LM_LOW mode :

- INSMODE: Wavelength range / spectral channels
- Fringe tracker -> allowed max DITs
- Seeing quality
- Total integration time (s) on SCI

-> realistic noise

ASPRO 2: OIFits simulator



- Exact Fourier Transform from user model images
- Noise modelling:
  - Target photometry
  - Atm. transmission
  - Instrument parameters
- Export OIFits files:
  - enable further tests for detection of requested features, optimal integration time etc.

ASPRO2: advanced features

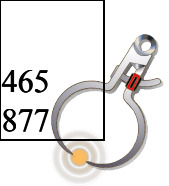
- GRAVITY dual field: set ancillary stars (FT, AO, GS)
- MATISSE errors checked with ESO's ETC (A. Matter)

- ASPRO2 Command line Interface to compute observables from data + user model (AMHRA)

SearchCal / JSDC

Search Calibrators

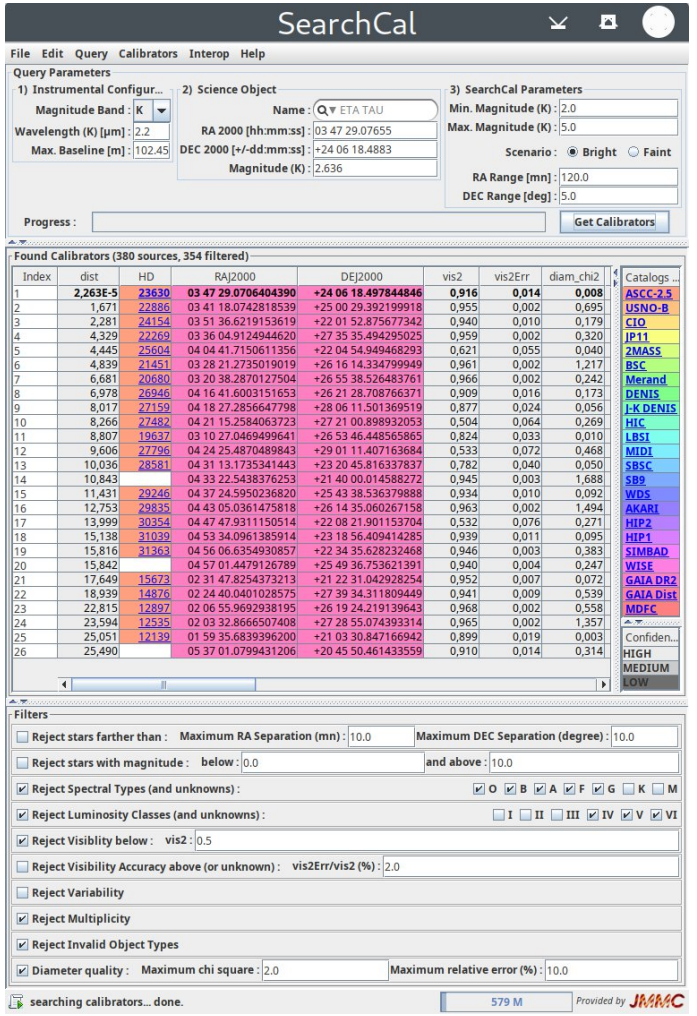
JMMC Stellar Diameter Catalog



SearchCal 5 / JSDC 2

SearchCal 5:

- Search Calibrators close to your target object and photometries
- Filter results (SP type, luminosity, V2 …)
- Interoperability with ASPRO2, Aladin
- based on JSDC2: faster & more accurate
- BRIGHT / FAINT scenarios on [BVRJHKLMN] bands



JSDC 2 @CDS: Vizier II/346 ~ 465 000 stellar diameters

a ~20 years of scientific improvement with published results in A&A

JSDC 3 : 475 000 stars ... to 2.5m stars !

Improvements in 2020:

- Crossmatch +++ : best in 3as neighbourhood + xmatch flags = No duplicates.

"CalFlag bit 3 set if the star has neighbours within 0.5 as (GAIA) or 1.0 as (2MASS)"

- Data: SIMBAD, GAIA DR2 (better ra/dec, pm, teff, dist), MDFC (flag, flux)
- *JSDC3 BRIGHT EA* : http://jmmc.fr/~bourgesl/sclsvr_JSDC/JSDC_2020/LAST/
- *JSDC3 FAINT EA* : http://jmmc.fr/~bourgesl/sclsvr_JSDC/JSDC_FAINT_2020/LAST/

Services: SearchCal 6 EA and GetStar EA

TODO:

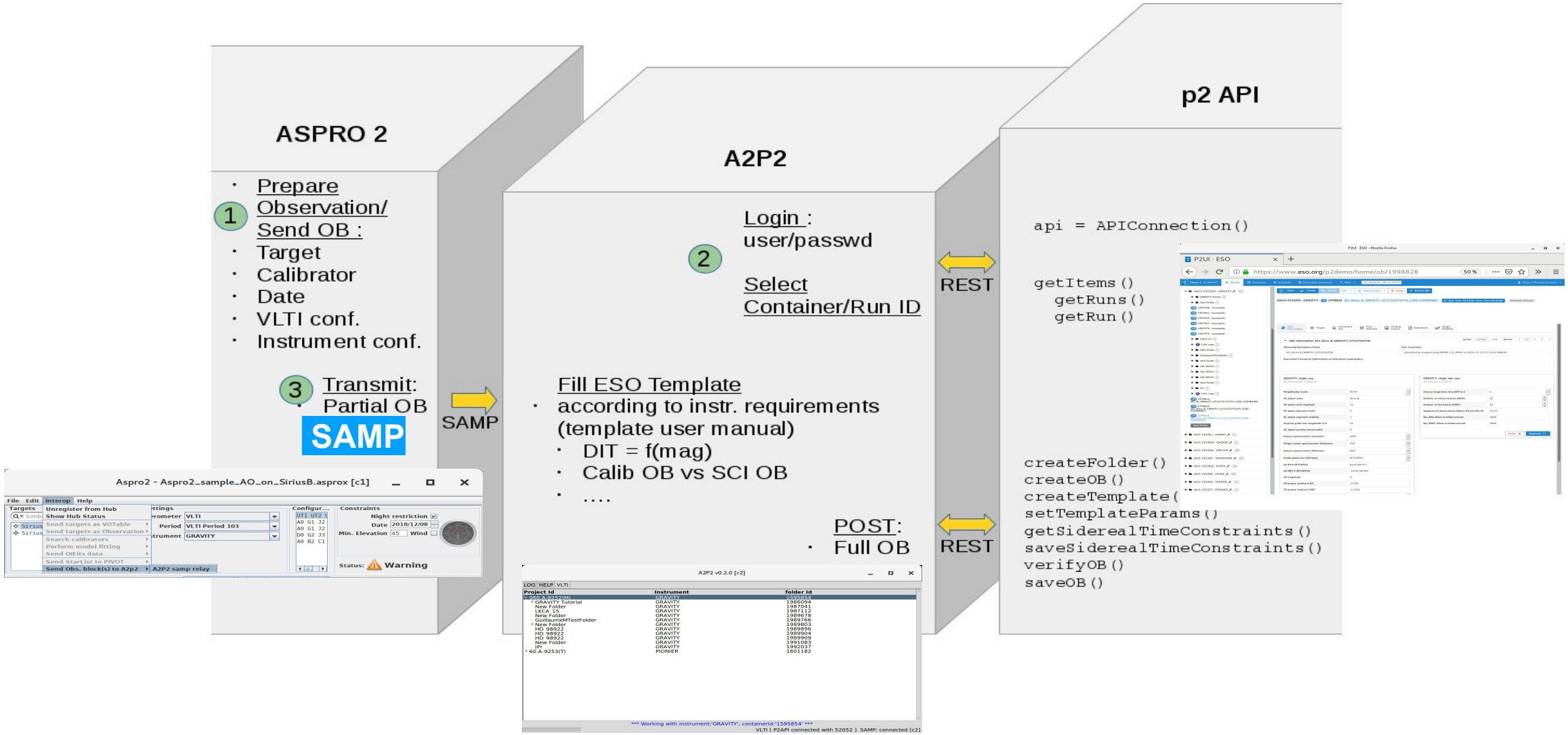
- Publish both Bright / Faint catalogs : 2.5m star in JMMC TAP + CDS
- Future: use JMDC and new colors GAIA (G, Bp, Rp) + All Wise (L, M, N)

a2p2

A2P2: Automatic OB creation & submission

- A2P2 : open-source python tool
  - https://github.com/JMMC-OpenDev/a2p2 to collaborate with instrument scientists
- SAMP gateway to complete & forward Aspro2's O.B. (obxml) to ESO P2 (p2api)
  - **handles concatenations, SCI+CAL, AO/FT/GS targets**
- basic support for PIONIER and GRAVITY, work in progress for MATISSE

A2P2 workflow



A2P2

- Still need work to properly support two rolling periods simultaneously
  - rely on a local configuration (json extraction of p2 config)
  - no formal schedule for updates
- Work required to properly cover and test implementation rules for templates to provide
  - Up-to-date instrument knowledge mandatory => need help from Instrument Scientists
  - Engineer help still required after first releases
- TODO :
  - handle multiple targets batch support from Aspro2 : survey mode (SPICA survey, Large Programs...)
  - feed CHARA observation control system

Next operations (mid / long term)

Enhance consistency with ESO :

- improve A2P2 for MATISSE (GRA4MAT)
- maintain Aspro Configuration up-to-date for VLTI & instruments (shadowing, switchyard, observing modes, noise parameters)
- GRAVITY+

Questions ?

Future Preparation Project @ JMMC

ObsPrep db:

"Prepare, update, follow groups of observations"

- for Surveys or Large Programs
- in a collaborative way
- linked to existing tools

SPICA-DB Project @ JMMC

SPICA-DB is developed on top of (OiDB + ObsPortal + TAP) services + JSDC data + few specific SPICA services to ingest data and manage database (authentication + specific web interface) :

- SPICA query interface
- ASPRO2 enhancements:
  - Handle large programs (**filters**) + target extra informations
  - Manage observations with different instrument, modes (**multi-setup**)
  - **Improve interoperability** (votable / CSV) with VO tools
- Obs Portal: SPICA / CHARA logs + data quality flags
- OiDB: index SPICA OIFITS files (raw, calibrated, data links)

=> New JMMC TAP server : JSDC + obs portal + OiDB (unified view) !

SPICA-DB Project @ JMMC

Early result:

Import SPICA's Science DB in ASPRO2:

~ 3000 sources grouped by Work Package

(votable + samp : large table)